

Faster Aerodynamic Simulation With Cart3D

A NASA-developed aerodynamic simulation tool is ensuring the safety of future space operations while providing designers and engineers with an automated, highly accurate computer simulation suite. Cart3D, co-winner of NASA's 2002 Software of the Year award, is the result of over 10 years of research and software development conducted by Michael Aftosmis and Dr. John Melton of Ames Research Center and Professor Marsha Berger of the Courant Institute at New York University.

Cart3D offers a revolutionary approach to computational fluid dynamics (CFD), the computer simulation of how fluids and gases flow around an object of a particular design. By fusing technological advancements in diverse fields such as mineralogy, computer graphics, computational geometry, and fluid dynamics, the software provides a new industrial geometry processing and fluid analysis capability with unsurpassed automation and efficiency.

Before the development of Cart3D, grid layouts used to analyze the designs of airplanes and spacecraft needed to be hand-generated, requiring months or even years to produce complex models. Engineers develop these grids to calculate flow fields surrounding vehicles like the Space Shuttle. Cart3D automates grid generation to a remarkable degree, reducing simulation time requirements significantly. The software streamlines the conceptual and preliminary analysis of both new and existing aerospace vehicles. The Cart3D package includes utilities for geometry import, surface modeling and intersection, mesh generation, and flow simulation.

Through a joint agreement with the Ames Commercial Technology Office, ANSYS, Inc., a global innovator of simulation software and technologies designed to optimize product development processes, has integrated the Cart3D product into its ICEM CFD Engineering (an ANSYS subsidiary) product suite for commercial distribution. The package includes several new features, including a graphical user interface for analysis setup. It also incorporates the company's technology for geometry acquisition, repair, and preparation. Computer-aided design (CAD) geometry is directly imported with the company's Direct CAD Interfaces. Designers and engineers can automatically set up and run suites of simulations based on parametric changes to CAD geometry models.

Today, several commercial users, NASA, and leading universities such as the Massachusetts Institute of Technology, Johns Hopkins University, and Stanford University, benefit from Cart3D's capabilities. Northrop Grumman and Raytheon apply Cart3D to the analysis and conceptual design of military vehicles and commercial aircraft. Simulations generated by the program help to identify and fix problems with transport aircraft and helicopters. At Johnson Space Center, Cart3D simulates various crew escape configurations for NASA's Space Launch Initiative program.

ANSYS intends to expand Cart3D's applications well beyond traditional aerospace uses, to aerodynamic and fluid flow simulations in automotive, turbomachinery, electronics, and process industries.

Cart3D automates the grid layouts for aircraft and spacecraft design analysis.

